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Adnan Akay joined Bilkent University on January 1, 2009 as Vice President and the founding head of Mechanical Engineering Department. He moved to Bilkent from the U.S. National Science Foundation where he was the director of the Division of Civil, Mechanical and Manufacturing Innovation Division. Between 1992 and 2005 Dr. Akay was the head of the Mechanical Engineering Department at Carnegie Mellon University where he currently holds the title of Lord Professor of Engineering. Prior to joining Carnegie Mellon, he was on the faculty at Wayne State University, where he last held the DeVlieg Chair in Engineering, and prior to that he was with the National Institutes of Health. He has held visiting appointments at several universities and continues to collaborate with colleagues at the University of Rome "La Sapienza," and Institut National des Sciences Appliquées (INSA) de Lyon in France. He also serves as an advisor to numerous companies and universities. Adnan Akay's research area is in acoustics, vibrations, dissipation theories and friction. He has been recognized with several awards including the Per Brüel Gold Medal in Acoustics and Noise Control in 2005 from ASME. He is a Fellow of the American Society of Mechanical Engineers and the Acoustical Society of America.

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Mega-Cities, Mega-Disasters and Disaster Mitigation

Mega disasters result when a natural mega event, such as a high intensity earthquake, typhoon, hurricane or Tsunami, or a human-induced large-scale event strikes a mega-city, possibly leading to multi-event catastrophes. Multiple events such as fires, floods, breakout of diseases, and release of toxins to the environment start a chain reaction of failure of services, communication and transportation and other similar life lines of a mega-city. Together with such physical failures, loss of human life and human suffering, long-term disruption of life in general lead to a mega-disaster.

From the viewpoint of disaster mitigation or reduction, mega-disasters may be considered in three parts. Before, during, and after a mega event becomes a mega-disaster. All the training, education, and preparedness that take place can help mitigate the scope of the disaster with appropriate responses by everyone. Such preparedness requires close collaboration of technical, social, and legislative components of a civil society. Focusing only on the engineering aspects, vulnerabilities of infrastructure need to be identified and strengthened to reduce the possibility of a chain reaction of events.

Strengthening the widespread vulnerabilities that exist in many of the well established mega cities require resource that may not be readily available and, thus, requires mega will supported by sound risk assessment methodologies.

When considered from a technical viewpoint, a mega event consists of energy build-up, energy transport, and energy dissipation. The engineering aspects of energy release or dissipation at a mega-city involves infrastructure and has been well considered. The forecasting of natural mega events still needs further understanding, particularly, of the source during energy build-up and release.

Since different mega events have different time scales during which energy is built up and transported, they need different considerations. For instance, the ratio of the time it takes to build up energy before an earthquake to the time it takes to deliver it is inverse of, say, that of a hurricane. Notwithstanding the slower development of energy build up before an earthquake, forecasting it with a useful lead time and certainty is still not available. As an example of what can be investigated, the relative motion at the fault lines exhibit “micro” stick-slips that have been measured using sensors placed deep in earth. These are not unlike micro stick-slip that develops between the flat surfaces of two solid bodies. A better understanding of the latter may lead to the same of the former.